

## An Over-temperature Limit Controller With User Defined Messages

Watlow's SERIES 97 is a microprocessor-based controller with a single input, second auxiliary input and four outputs. Input one is used to measure temperature from a sensor. Input two can be utilized as a remote reset switch or a hardware lockout switch. With up to four outputs, the controller is versatile in handling applications that require a high/low limit, alarms, retransmit and communications. The control is so user friendly that it can be set up to display safety and limit messages created by the end user to meet the exact application need.

The SERIES 97 limit controller is added to thermal applications to limit over-temperature conditions. The SERIES 97 limit controller provides safety assurance against instances where a high temperature runaway condition could occur from a shorted input sensor or an output device that could fail in a closed position.

The SERIES 97 is recommended for any application where thermal runaway could result in large product scrap costs, affect operator safety, cause damage to equipment or create a fire hazard.

The SERIES 97 is manufactured by ISO 9001 registered Watlow Winona and reliably backed up by a three-year warranty.



### Features and Benefits

#### Programmable messages

- Controller can be set up to display user programmed limit message

#### NEMA 4X (IP65)

- Water and corrosion resistant; front panel can be washed down

#### Microprocessor-based

- Accurate set point settings and quick output response

#### Second auxiliary input

- Remote reset capability

#### Four outputs

- Handles high/low limit, alarms, communication and retransmit requirements

#### Software and hardware lockouts

- High security



1241 Bundy Boulevard  
Winona, Minnesota 55987-5580 USA  
Phone: +1 (507) 454-5300  
Fax: +1 (507) 452-4507  
Internet: [www.watlow.com](http://www.watlow.com)  
e-mail: [info@watlow.com](mailto:info@watlow.com)

WIN-97-1203

ISO 9001



Registered Company  
Winona, Minnesota USA



## Specifications

### Controller

- Microprocessor-based
- Universal input 1, auxiliary input 2, 4 outputs
- Input sample period; Single input 10Hz (100 msec), dual input 5Hz (200 msec) digital filter adjustable
- Display update; 2Hz (500 msec), time filter adjustable
- Input/Output/Communication isolation
- Displayed in °C, °F

### Operator Interface

- Dual 4-digit LED displays: upper 10.2 mm (0.4 in.), lower 6.2 mm (0.244 in.)
- Advance, Up Arrow, Down Arrow, Reset tactile keys

### Standard Conditions For Specifications

- Ambient temperature 77°F (25°C) ±3°C, rated line voltage, 50 to 60Hz, 0 to 90 percent RH non-condensing, 15 minute warm-up

### Universal Input 1

#### Thermocouple

- Type J, K, T, N, C (W5), E, PTII, D (W3), B, R, S thermocouple types
- >20MΩ input impedance
- Maximum 20Ω source resistance
- 30mA open detection bias

#### RTD

- 2- or 3-wire platinum, 100Ω
- JIS and DIN curves
- Whole or tenth degree indication
- 150μA nominal RTD excitation current

### Input 2

#### Event Input

- Contact or voltage
- 20KΩ input impedance
- Voltage input: event high state 3 to 36V=(dc), event low state 0 to 2V=(dc)
- Resistance/contact input: event high state > 23kΩ, event low state 0 to 2kΩ

### Output Types

#### Open Collector/Switched DC

- Open collector configuration:  
Maximum voltage 42V=(dc)  
Maximum current 200mA  
Maximum "on" resistance 1.1Ω  
Maximum offstate leakage current 100μA
- Switched dc configuration:  
Switched dc supply voltage 22 to 28V=(dc)  
dc supply current limited to 30mA

### Solid State Relay

- Optically isolated
- Zero cross switched
- Without contact suppression
- Minimum load current 0.5mA rms

### Solid State Relay (cont.)

- Maximum current 0.5A rms at 20 to 280V~(ac)
- Maximum offstate leakage current 10μA rms
- For resistive loads only, must use RC suppression for inductive loads

### Electromechanical Relay

- Form C contact configuration
- Minimum load current 10mA @ 5V=(dc)
- Rated resistive and inductive loads: 2A @ 250V~(ac) or 30V=(dc) maximum
- Electrical life 100,000 cycles at rated current
- For resistive loads only, must use RC suppression for inductive loads

### Retransmit

- Range selectable: 0-20mA, 4-20mA, 0-5V=(dc), 1-5V=(dc), 0-10V=(dc)
- 0 to 10V=(dc) voltage output into a 1,000Ω minimum load resistance
- 0 to 20mA current output into an 800Ω maximum load resistance
- Resolution:  
Vdc ranges = 2.5mV nominal  
mA ranges = 5μA nominal
- Calibration accuracy:  
Vdc ranges = ±15mV  
mA ranges = ±30μA
- Temperature stability 100ppm/°C

### Communications

- EIA/TIA-485, EIA/TIA-232
- Opto-isolated
- Modbus™ RTU protocol
- 1200, 2400, 4800, 9600, 19200 baud rates
- 32 maximum units can be connected (With additional 485 repeater hardware, up to 247 units may be connected)

### Accuracy

- Input ranges

Type J:	0 to 750°C	or	32 to 1382°F
Type K:	-200 to 1250°C	or	-328 to 2282°F
Type T:	-200 to 350°C	or	-328 to 662°F
Type N:	0 to 1250°C	or	32 to 2282°F
Type E:	-200 to 900°C	or	-328 to 1470°F
Type C(W5):	0 to 2315°C	or	32 to 4200°F
Type D(W3):	0 to 2315°C	or	32 to 4200°F
Type PTII:	0 to 1393°C	or	32 to 2540°F
Type R:	0 to 1450°C	or	32 to 2642°F
Type S:	0 to 1450°C	or	32 to 2642°F
Type B:	870 to 1700°C	or	1598 to 3092°F
DIN:	-200 to 800°C	or	-328 to 1472°F
JIS:	-200 to 630°C	or	-328 to 1166°F

### Thermocouple Inputs

- Calibration accuracy  $\pm 0.1$  percent of span  $\pm 1^\circ\text{C}$  at standard conditions
- Exceptions:
  - Type T; 0.12 percent of span for  $-200^\circ\text{C}$  to  $-50^\circ\text{C}$  ( $-328^\circ\text{F}$  to  $-58^\circ\text{F}$ )
  - Types R and S; 0.15 percent of span for  $0^\circ\text{C}$  to  $100^\circ\text{C}$  ( $32^\circ\text{F}$  to  $212^\circ\text{F}$ )
  - Types B; 0.24 percent of span for  $870^\circ\text{C}$  to  $1700^\circ\text{C}$  ( $1598^\circ\text{F}$  to  $3092^\circ\text{F}$ )
- Accuracy span:  $540^\circ\text{C}$  ( $1000^\circ\text{F}$ ) minimum
- Temperature stability:  $\pm 0.1$  degree per degree change in ambient

### RTD Inputs

- Calibration accuracy  $\pm 0.1$  percent of span  $\pm 1^\circ\text{C}$  at standard conditions
- Accuracy span:  $540^\circ\text{C}$  ( $1000^\circ\text{F}$ ) minimum
- Temperature stability:  $\pm 0.05$  degree per degree change in ambient

### Agency Approvals

- FM Class 3545, File # J.I. 1B5A6.AF
- NEMA 4X, IP65
- CE 89/336/EEC, electromagnetic compatibility directive
- CE 73/23/EEC, low-voltage directive

### Terminals

- Touch safe
- 22 to 12 AWG

### Power

- 100-240V~(ac) +10 percent, -15 percent; 50/60Hz,  $\pm 5$  percent
- 24-28V~(ac) or V=(dc) +10 percent, -15 percent; 50/60Hz,  $\pm 5$  percent
- 7.0VA maximum power consumption
- Data retention upon power failure via nonvolatile memory

### Operating Environment

- 0 to  $65^\circ\text{C}$  ( $32$  to  $149^\circ\text{F}$ )
- 0 to 90 percent RH, non-condensing
- Storage temperature:  $-40$  to  $85^\circ\text{C}$  ( $-40$  to  $185^\circ\text{F}$ )

### Dimensions

- Width 52 mm (2.05 in.)
- Height 52 mm (2.05 in.)
- Length 107 mm (4.2 in.)
- Depth behind panel surface 98.4 mm (3.875 in.)
- Approximate controller weight 0.2 kg (0.4 lbs)

### Allowable Operating Ranges

Type J:	1.0	0	to	$815^\circ\text{C}$	or	32	to	$1500^\circ\text{F}$
	0.1	0.0	to	$815.0^\circ\text{C}$	or	32.0	to	$999.9^\circ\text{F}$
Type K:	1.0	-270	to	$1370^\circ\text{C}$	or	-454	to	$2500^\circ\text{F}$
	0.1	-199.9	to	$999.9^\circ\text{C}$	or	-199.9	to	$999.9^\circ\text{F}$
Type T:	1.0	-270	to	$400^\circ\text{C}$	or	-454	to	$750^\circ\text{F}$
	0.1	-199.9	to	$400.0^\circ\text{C}$	or	-199.9	to	$750.0^\circ\text{F}$
Type N:	1.0	0	to	$1300^\circ\text{C}$	or	32	to	$2372^\circ\text{F}$
	0.1	0.0	to	$999.9^\circ\text{C}$	or	32.0	to	$999.9^\circ\text{F}$
Type E:	1.0	-270	to	$800^\circ\text{C}$	or	-454	to	$1470^\circ\text{F}$
	0.1	-110.0	to	$800.0^\circ\text{C}$	or	-199.9	to	$999.9^\circ\text{F}$
Type C:	1.0	0	to	$2315^\circ\text{C}$	or	32	to	$4200^\circ\text{F}$
	0.1	0.0	to	$999.9^\circ\text{C}$	or	32.0	to	$999.9^\circ\text{F}$
Type D:	1.0	0	to	$2315^\circ\text{C}$	or	32	to	$4200^\circ\text{F}$
	0.1	0.0	to	$999.9^\circ\text{C}$	or	32.0	to	$999.9^\circ\text{F}$
Type PTII:	1.0	0	to	$1395^\circ\text{C}$	or	32	to	$2543^\circ\text{F}$
	0.1	0.0	to	$999.9^\circ\text{C}$	or	32.0	to	$999.9^\circ\text{F}$
Type R:	1.0	0	to	$1760^\circ\text{C}$	or	32	to	$3200^\circ\text{F}$
Type S:	1.0	0	to	$1760^\circ\text{C}$	or	32	to	$3200^\circ\text{F}$
Type B:	1.0	0	to	$1816^\circ\text{C}$	or	32	to	$3300^\circ\text{F}$
DIN	1.0	-200	to	$800^\circ\text{C}$	or	-328	to	$1472^\circ\text{F}$
	0.1	-199.9	to	$800.0^\circ\text{C}$	or	-199.9	to	$999.9^\circ\text{F}$
JIS	1.0	-200	to	$630^\circ\text{C}$	or	-328	to	$1166^\circ\text{F}$
	0.1	-199.9	to	$630.0^\circ\text{C}$	or	-199.9	to	$999.9^\circ\text{F}$

### Functionality Matrix

	Universal Input	Event	High/Low Limit	High/Low Alarm	Retransmit	232 485 Comm
Input 1						
Input 2						
Output 1						
Output 2						
Output 3						
Output 4						

Note: These specifications are subject to change without prior notice.

## Ordering Information

### SERIES 97

Microprocessor-based  
 $\frac{1}{6}$  DIN with universal input 1,  
 thermocouple and RTD.  
 Options include: software, power  
 supply, input 2, four outputs and  
 display color

#### Power Supply

A = 100-240V $\approx$ (ac/dc)

B = 24-28V $\approx$ (ac/dc)

#### Auxiliary Input 2

0 = None

1 = Event input

#### Limit Output 1

D = Electromechanical relay, Form C,  
 2A, without RC suppression

#### Alarm Output 2

A = None

C = Switched dc output/open collector

D = Electromechanical relay, Form C,  
 2A, without RC suppression

K = 0.5A solid state relay without  
 RC suppression

#### Alarm Output 3

A = None

D = Electromechanical relay, Form C,  
 2A, without RC suppression

#### Auxiliary Output 4

A = None

D = Electromechanical relay, Form C,  
 2A, without RC suppression

R = 232 Communications

U = 485 Communications

M = Universal Retransmit, range selectable: 0-20mA,  
 4-20mA, 0-5V $\approx$ (dc), 1-5V $\approx$ (dc),  
 0-10V $\approx$ (dc)

#### Software/Preset Parameters

00 = Standard software

#### Display/Overlay

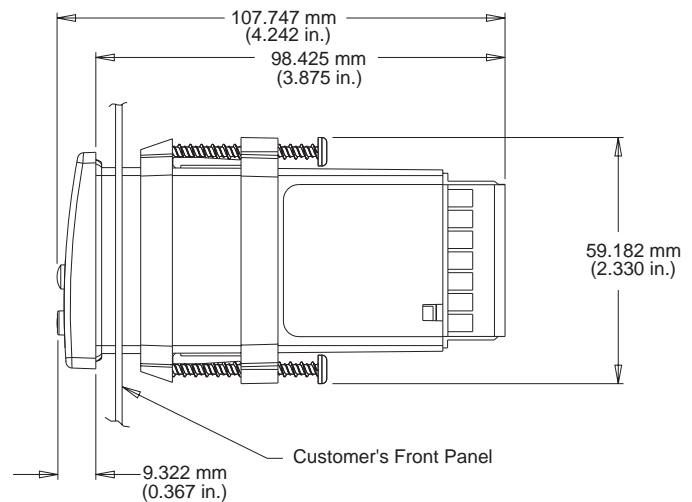
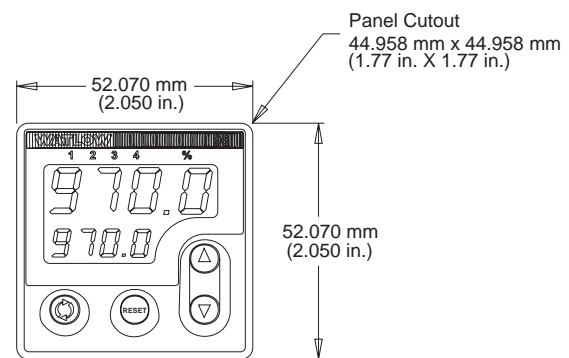
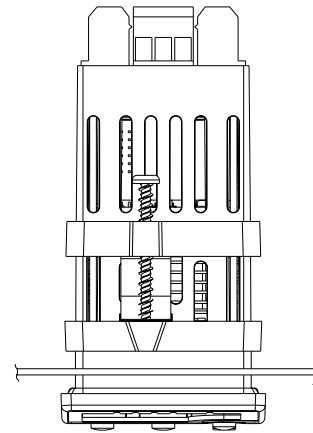
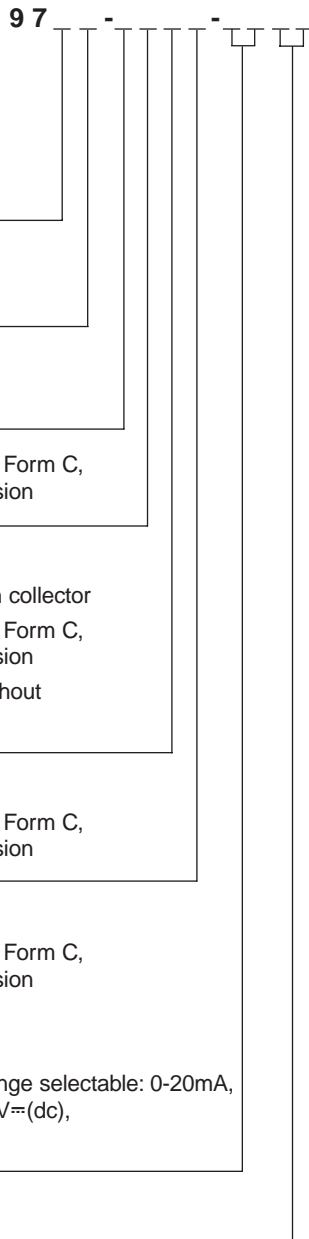
Upper/Lower

RR = Red/Red display

RG = Red/Green display

GR = Green/Red display

GG = Green/Green display



To be automatically connected to the nearest North American Technical and Sales Office call:

# 1-800-WATLOW2

**International Technical and Sales Offices:** Australia, +61 (39) 335-6449 • China, +86 (21) 6277-2138 • France, +33 (01) 3073-2425 • Germany, +49 (0) 7253-9400-0 • Italy, +39 (02) 458-8841 • Japan, +81 (03) 5403-4688 • Korea, +82 (02) 575-9804 • Malaysia, +60 (4) 641-5977 • Mexico, +52 (442) 217-6235 • Singapore, +65 6773-9488 • Spain, +34 916 759 192 • Sweden, +46 31 7014959 • Taiwan, +886 (0) 7-288-5168 • Sweden, +46 31 7014959 • United Kingdom, +44 (0) 115-964-0777